IWG Program Summary

William E. Liss
Associate Director
Gas Technology Institute

Collaborative NGV Program Update

- DOE/GRI Collaborative Vehicle & Infrastructure Program
  - Engine Efficiency Developments
    - Work with Cummins, Deere, and Mack to develop high-efficiency natural gas engines
      - Specific focus on improved part-load efficiency
      - Reduced emission levels
    - Completed
  - Vehicle Systems Integration
    - Completed
  - **Infrastructure Working Group**
    - Several technology and product development projects
    - Many efforts through competitive solicitation
    - Work jointly sponsored by DOE, GRI, and other cofunding partners
    - Joint infrastructure development with Ford and several industry players

NGV-IWG Initiatives

- IWG Program Management (GTI)
- Consistent Fuel Use Accounting (Energy Int'l)
- Best Practices for CNG Fuel Stations (Marathon)
- Advanced Fuel Appliance Technology (FuelMaker)
- NGV Codes & Standards Support (NGVC)
- Economic Assessment of NGV Fueling (Battelle)
- NGV Fueling Infrastructure Technology Exchange (NGV Institute)
- Improved CNG Dispensers (ANGI International)
- L-CNG Fueling Station (ALT USA)
- LNG Nozzle Program (CH-IV)
- Odorants for Liquefied Natural Gas (USA Pro)

NOTE: Underlined items covered during the meeting.

NGV-IWG Projects

- Economic Assessment of NGV Fueling (Battelle)
  - Goal was to look at fueling station costs
  - For several reasons, decision made to end task
  - Funds were redirected to NGV dispenser development
- NGV Fueling Infrastructure Technology Exchange (NGV Institute)
  - Semi-annual meetings held
  - Built on effort started in early ’90s by SoCal Gas and Brooklyn Union Gas for fueling station operators to exchange information and insights
  - Effort continues based on operators contributing to meeting costs

NGV-IWG Projects

- Improved CNG Dispensers (ANGI International)*
  - Initiated program to develop several natural gas dispenser advancements
  - Goal is to target improved performance, flexibility, and reduced cost
  - Two-fold approach
    - Improving "standard" dispensers through series of technology and product advancements
      - Cost reductions up to 30%
    - Develop "derivative" lower-cost product based on two-hose, two-pressure, single meter topography
  - System to include advanced underfill compensation techniques, including the GTI AccuFill
  - Several other now confidential technology advancements are being evaluated

* Confidentiality agreement limits discussing details of the technology development and commercialization plan

NGV-IWG Projects

- L-CNG Fueling Station (ALT USA)
  - Upgraded system installed in Ontario, CA
  - Provides immediate LNG dispensing without "pump cool down period"
  - New duplex pump replaced previous LCNG triplex pump.
  - Can also dispense LNG and LCNG simultaneously

  - Piping modifications made to improve performance and efficiency of the station.
  - System designed to meet the requirements for Weights & Measures in California

NGV-IWG Projects

- LNG Nozzle Program (CH-IV)
  - User survey complete
  - Recommendations for test procedure underway
  - GTI has taken lead on working to reach industry consensus
  - Resources needed to support testing and verification efforts
- Odorants for LNG (USA Pro)
  - Project evaluating efficacy of LNG odorants
  - SCAQMD Cofunding

ODORANT	STRUCTURAL FORMULA	MOLECULAR WEIGHT	SULFUR WEIGHT %	FREEZING (°F)	BOILING (°F)
Tertiary butyl mercaptan	$C(CH_3)_3SH$	90.19	35.5	34	148
Isopropyl mercaptan	$(CH_3)_2$-CHSH	76.16	42.0	-203	127
Secondary butyl mercaptan	CH_3-CH_2-CHSH-CH_3	90.19	35.5	-220	185
Ethyl mercaptan	CH_3-CH_2SH	62.13	51.6	-234	95
Tetrahydorthiophene	-CH_2-CH_2-CH_2-CH_2-S-	88.17	36.4	-141	250

NGV-IWG Projects

- LNG Odorants (cont.)
- Selected two odorants in two concentrations for initial experiments
  - EM, 1% & 4% by weight in propane
  - THT, 1% & 4% by weight in propane
- Initial experiments to test sampling and GC measurement technique
- Odorant-propane conditioning (cool-down) and precipitation tests also underway
- LNG odorization, sampling, and measurement tests planned using fuel tanks provided by NexGen

Summary

- NGV-IWG Program Nearing Completion
  - Efforts on HRA, Dispenser, LNG nozzles, LNG odorants
- Recommend Continued Support for NGV Fueling Infrastructure Technology Development
  - Focus on improved reliability, customer satisfaction, and cost reduction